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Environmental and Outdoor Education

Year one

Module 3

Learning About Trees

Distance Learning

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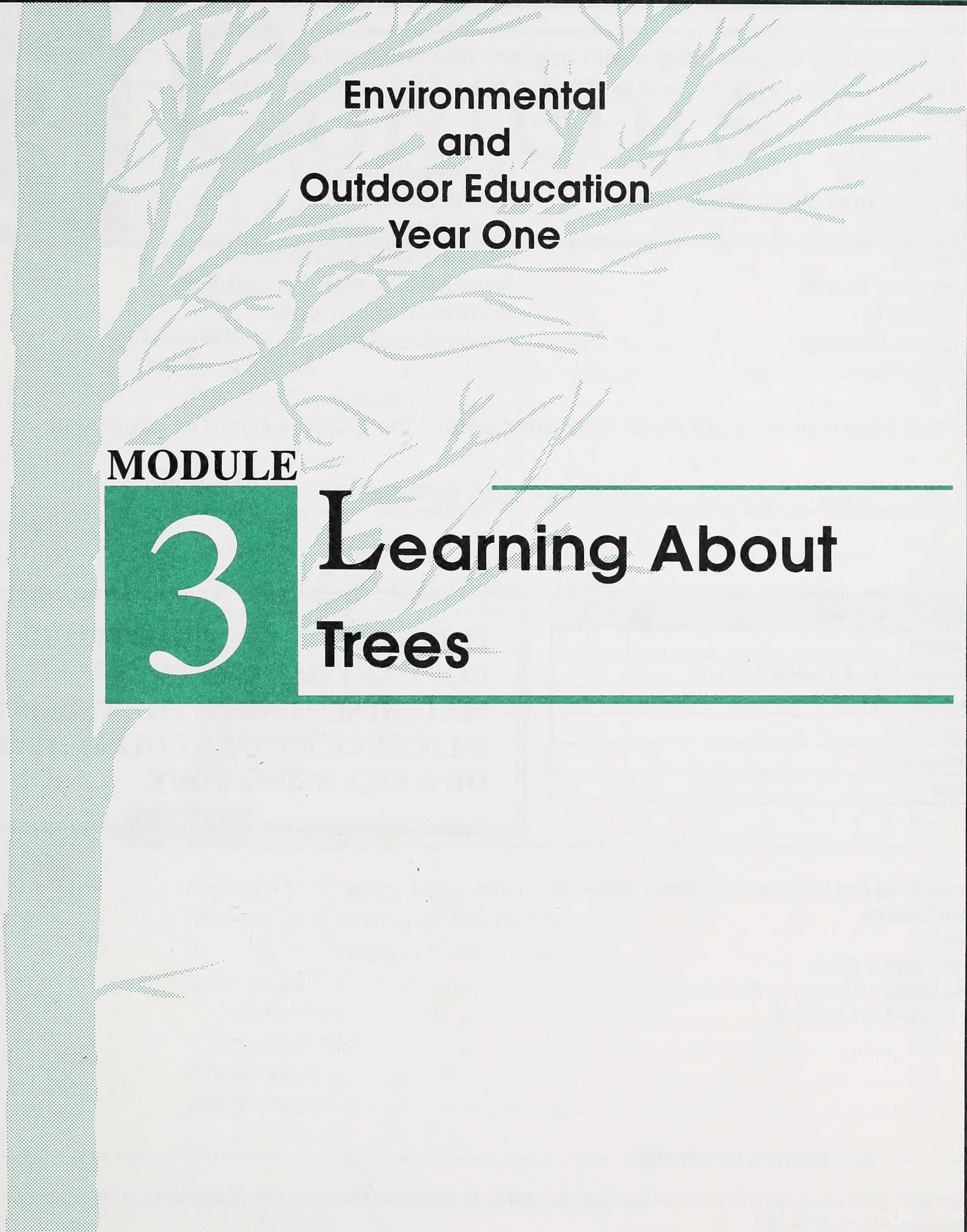

Environmental
and
Outdoor Education
Year One

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3
Learning About Trees

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ACKNOWLEDGEMENTS

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Student Module
Module 3
Learning About Trees
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MODULE

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OVERVIEW

Have you visited a forest for a picnic, hike, or camping trip? Have you travelled through a forest on your vacation or on a trip to visit someone? Have you been in an area where trees are cut for lumber, Christmas trees, or firewood. Have you seen animals by the side of the road while driving through a national or provincial park? If you have ever been in a forest, you probably noticed that there is a lot more to a forest than trees.

This module involves developing a deeper awareness and appreciation of the living and nonliving things that make up a forest ecosystem.

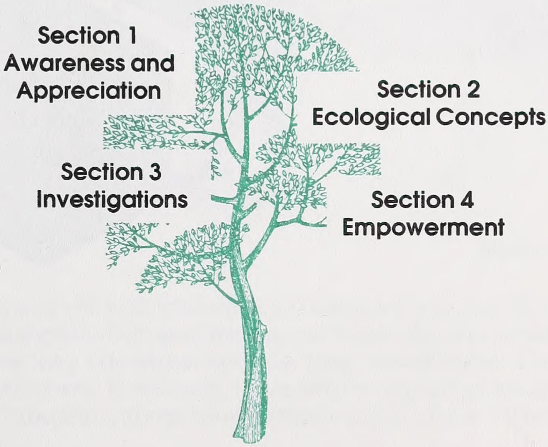
Trees are an important part of our environment. They are found in neighbourhoods, schoolyards, churches, cemeteries, and yards. They are found in great numbers in forests, and they support the forest industry.

Trees have many uses. They form shelter belts to protect farmland, they are an important feature of many parks and recreation sites, and they add beauty around homes, industrial sites, and busy roadways.

Trees also play an important role in the way life exists on our planet. They use the energy from the sun to produce food for living things; they make oxygen for people to breathe; they contribute to the water cycle (collect water with their roots and release it into the air from their leaves through transpiration). In addition, trees provide homes for wildlife. Finally, trees are involved in the process known as change. They change with the seasons and they change in shape and size as they grow older just like you.

It is important to keep our forests healthy and to use our forests wisely to maintain and improve our lives. Committing yourself to conservation actions will help ensure this happens.

MODULE 3
LEARNING ABOUT TREES



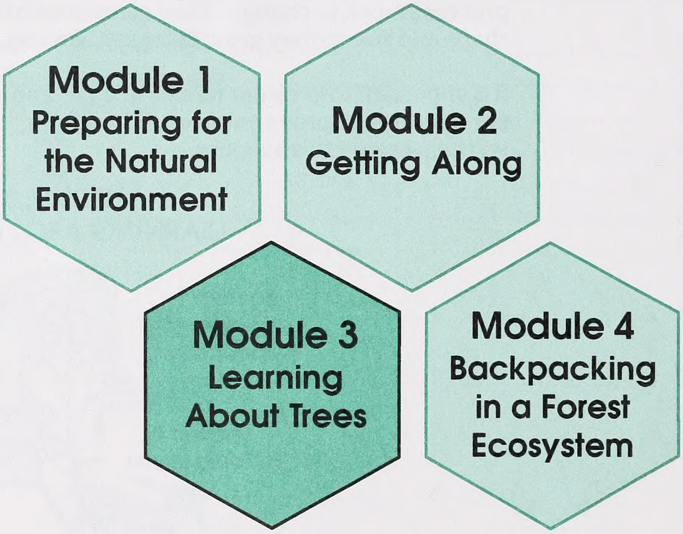
Evaluation

Your mark in this module will be determined by your work in the Assignment Booklet. You must complete all assignments. In this module you are expected to complete four section assignments. The assignment breakdown is as follows:

Section 1 Assignment	15 marks
Section 2 Assignment	35 marks
Section 3 Assignment	20 marks
Section 4 Assignment	30 marks
TOTAL	100 marks

Course Overview

This course contains four modules. The module you are working on is highlighted in a deeper colour.


Module 1
Preparing for the Natural Environment
Module 2
Getting Along
Module 3
Learning About Trees
Module 4
Backpacking in a Forest Ecosystem

SECTION
1

Awareness and Appreciation

How often are you asked where you live? How do you answer this question? Do you simply name your community or do you describe your home and your community? How would you describe your community? You may mention how friendly the people in your community are and what cultural groups they belong to? You may also want to explain the business in the area - where can you go for pizza or a hamburger? You may want to say that your community consists of houses or apartments, or it is a rural area with lots of farms. You may want to include the sports and recreational facilities - is there a lake, park, tennis courts, swimming pool, theatre, or video arcade centre nearby? What else could you include in your description? What about the number and types of trees in your community? What trees grow naturally and what trees have been planted? What do trees add to your community, or is it not important to have any trees? This section will increase your awareness and appreciation of the trees within your community.

WESTFILE INC.

In this section, you will look around your home, school, church, or community to see what kinds of trees grow there. As you examine trees, look to see how they are similar and how they are different. Trees are used for different purposes. In addition, there will be opportunities to use your senses to help you learn about trees so that you can draw a tree in more than one way.

ACTIVITY

1 Trees in Your Community

What kinds of trees grow in your community? The temperature, soil conditions, and other climatic factors will determine what trees are commonly found in your area. The common names that most people use to refer to trees have often been handed down from one generation to the next. You may be able to identify certain trees such as poplar, birch, or willow because your parents, or maybe even grandparents, told you the names of these trees. The names of trees were originally given due to such features as the following:

- the type of soil they grew in
  Example: swamp white oak grows in swamps
- a distinctive feature of the tree
  Example: weeping willow with drooping branches
- the name of a person
  Example: Engelmann spruce, named after American botanist George Engelmann
- identified by its product
  Example: sugar maple
- named from a geographical location
  Example: Manitoba maple

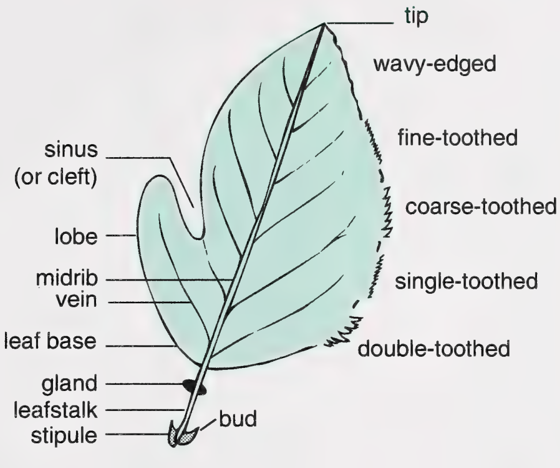
Sometimes the common names used to identify certain trees vary according to its location or region. These become local names.

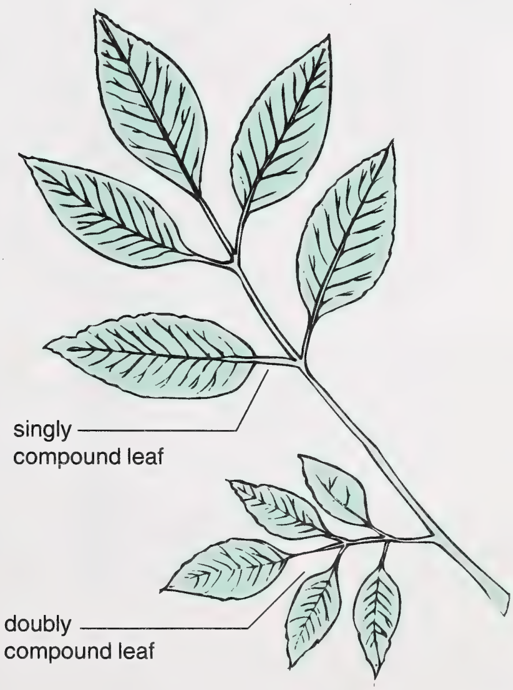
How much knowledge do you have about identifying the different kinds of trees in your community? Don't worry if your knowledge is somewhat limited. The first step involves the awareness of two different groups of trees - those with broad leaves and those with needle-like leaves. You are also likely aware that there are trees that lose their leaves in fall and those that stay green all winter. Leaves alone are not always the determining factor in identifying types of trees. Sometimes the flowers, fruit, twigs, and bark need to be examined to ensure a true identification of the type of tree.

You would need an extensive identification key or a field guide to trees and shrubs to be able to identify all the types of trees in your region. This would also involve learning a great amount of information, and would not be practical at this level of your studies.

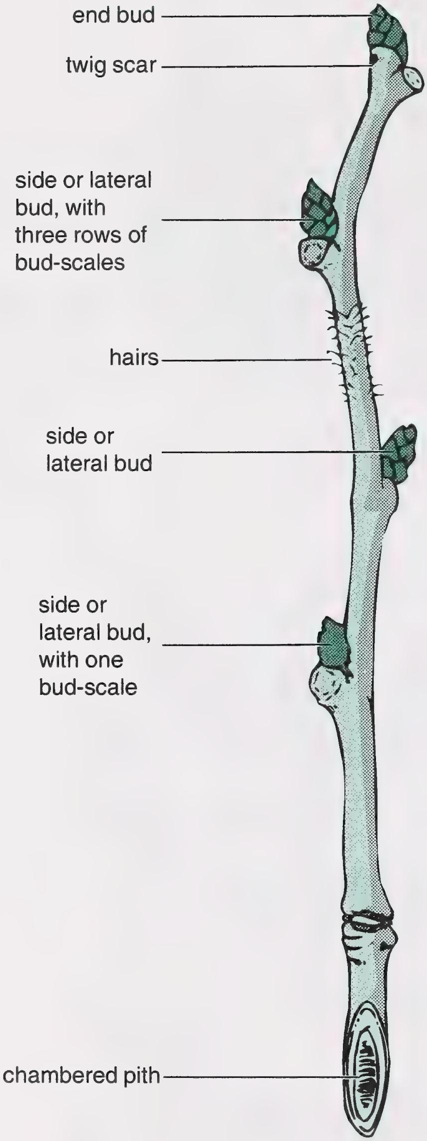
To help you examine the different characteristics of the types of trees in your area, look at the following diagrams of the types of leaves and twigs.

Leaf Terminology

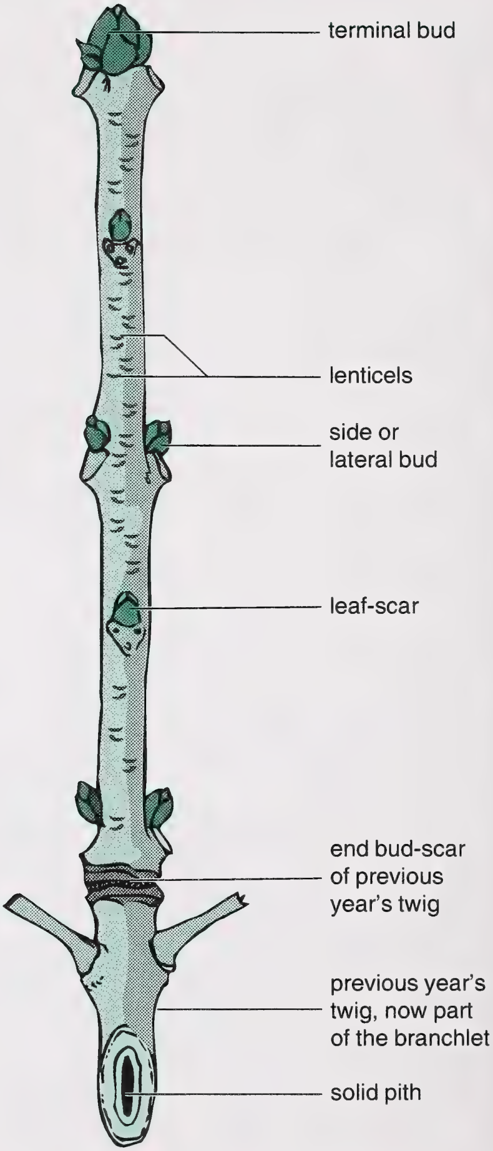




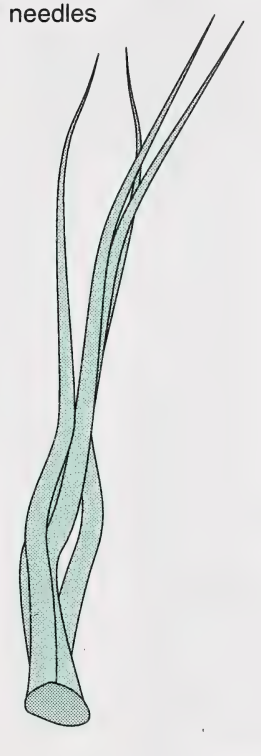
Winter Twig with Alternate Bud Arrangement


end bud
twig scar
side or lateral bud, with three rows of bud-scales
hairs
side or lateral bud
side or lateral bud, with one bud-scale
chambered pith

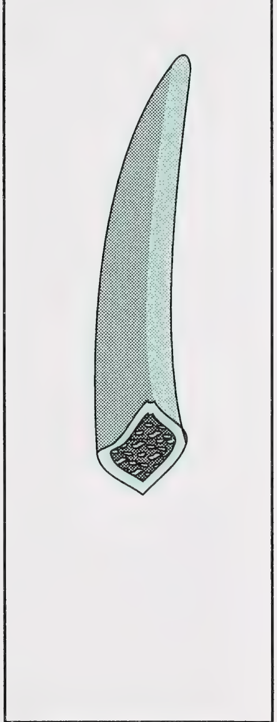
Winter Twig with Opposite Bud Arrangement


terminal bud
lenticels
side or lateral bud
leaf-scar
end bud-scar of previous year's twig
previous year's twig, now part of the branchlet
solid pith

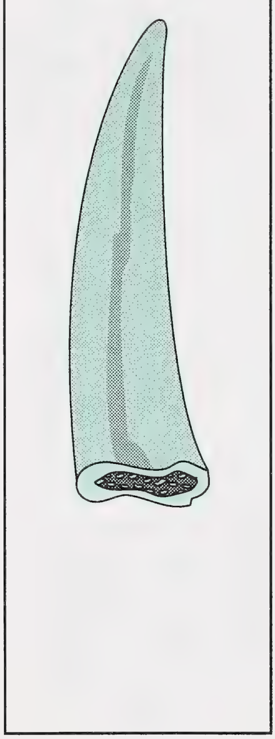
For trees that have needles, you may use the needles to identify the type of tree as well as other factors. Some trees have single needles and others have needle clusters. Some have flat needles and others have four-sided needles.



needle cluster of four needles



four-sided needle showing cross section



flat needle showing cross section

1. You are asked to examine some of the types of trees found in your community, and to give characteristics that distinguish the types of trees. Your parents or other adults may have helped you identify some of the known trees. You may know some trees from the flowers or blossoms you saw in a spring season, or the fruit you saw on them in summer and fall. You may use a tree guide if you have access to one.

   The following chart includes the names of some common trees found in Alberta, and a characteristic of each. Check (✔) the trees found in your community. List at least one other characteristic to help you recognize each type of tree.

   Try to complete as much of the chart as possible. You have room to add trees not listed at the bottom. Give two characteristics that can be used to identify the types of trees you added in the other category.

TREE	(✓)	CHARACTERISTICS	
aspen poplar		smooth bark	
balsam poplar		rough bark	
blue spruce		silvery-blue needles	
white spruce		four-sided, stiff needles	
fir		soft needles	
pine		needles in clusters of two or more	
green ash		five or more large leaflets/stem	
mountain ash		clusters of red berries in the fall	
apple		fruit in fall	
weeping birch		paper bark	
weeping willow		drooping branches	
laural willow		smooth bark	
Manitoba maple		lobed leaves	
white birch		upright branches	
elm		rough grey bark	
mayday		clusters of small flowers in spring	
cedar		rich aroma	
other (identify)			

2. You have been examining the characteristics by which trees are identified. You should have noticed that even though trees have their differences, they also have some things in common.

   Show how they are the same and how they are different by completing the following chart. An example has been done for you.

OUR COMMUNITY TREES	
Things they have in common	**Things that make them different**
They have leaves.	Leaves are different shapes.

It's important to have trees in your community. They may be found in parks, ravines, river valleys, environmental reserves, natural areas, roadways, cemeteries, golf courses, shelter belts, and around homes and other private property.

Trees provide a valuable service as shown in the following chart.

COMMUNITY TREES ARE IMPORTANT

- habitat for wildlife
- serve as barriers
- cool the planet
- reduce water runoff and soil erosion
- absorb noise
- absorb dust
- provide beauty
- provide shade
- provide wind breaks
- used for landscaping
- provide fences as boundaries

3. Look for examples of different uses of trees in your community; then choose four examples from those you discovered, and list them. A possible example is given.

   Example: Trees are planted on the hillside by Reservoir Park to reduce water runoff and soil erosion.

Share your answers with your learning facilitator.

ACTIVITY

2 Getting to Know a Tree

Do you have a favourite tree in your community? Perhaps there is one you like to go sit under on a hot summer day. Maybe it is a beautiful tree to photograph when it is covered with hoarfrost in winter. If you aren't familiar with a certain tree, go and check your neighbourhood or area for a single tree that appeals to you.

Use your sense of sight to observe the entire tree. Notice the shape, colour, texture, branching pattern, shape of leaves, flowers, fruit, or seeds. Form a window with your hands to focus your concentration. All you want to see is the one special tree.

Walk around it; look at it from different sides; lie under it and look up; get up high and look down (use a ladder, a balcony, or a window if possible).

Move in close for a detailed view. Look at every detail. Look for insects, spiders, or other crawly creatures.

1. Go to your favourite tree, or any tree in your neighbourhood, and do the following:

   a. Examine the tree by standing back, moving around, looking from below, and looking from above. Record your observations.

b. Move closer to the tree, and examine the tree in more detail. Record your observations.

2. Use your sense of touch to observe your special tree. Blindfold yourself so you can't see it. Use your hands to feel the tree. Is it smooth, rough, bumpy, sticky, or prickly? Find a rough part, then a smooth part; find a sharp part, then a blunt part. Record your observations.

3. Use your sense of smell to observe the tree. How does the tree smell? Is it musty, pungent, or sweet smelling? Does it have flowers that give off any odour? Smell the leaves or snap a needle. Do they have an odour? Is there a musty smell of lichen on the tree? Is there anything growing on the tree that smells? Describe your observations.

4. Use your sense of hearing to observe. Put your ear against the trunk. Is there any sound? Knock on the trunk. Listen to the sound of the wind or of wildlife in the tree. Record you observations.

Share your answers with your learning facilitator.

ACTIVITY 3

Drawing a Tree

In the previous activity you closely observed a tree using various senses (sight, touch, sound, and smell). You should have an increased awareness of what a tree is from these observations. In this activity you will use what you learned to draw some trees.

You will be asked to draw the whole tree as if you were an artist, a scientist, and a bird.

As you draw the tree, you will need to consider how the artist, scientist, and bird would view the tree. Try to think about what aspects of the tree would be important to each. Some clues are given in the instructions for each part.

1. Draw a tree as if you were an artist. Be careful to include colour, shape, and texture in your drawing.

2. Use the same tree, and look at it as if you were a scientist interested in the age, height, and characteristics of the tree. Draw and label the tree.

3. A bird could be on the ground below a tree, sitting on the tree, or above the tree. Draw the tree as if you were seeing it as a bird would see it.

Share your answers with your learning facilitator.

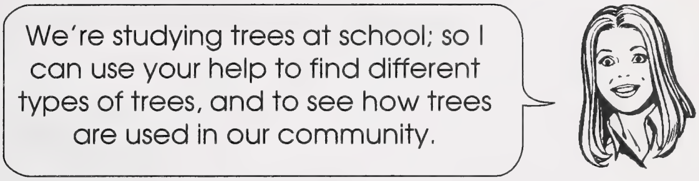
Follow-up Activities

If you had difficulties understanding the concepts in these activities, it is recommended that you do the Extra Help. If you have a clear understanding of the concepts, it is recommended that you do the Enrichment.

Extra Help

Mr. Marshall loved to go for walks around the community, and he liked it even better when his children, Cindy, Jaydn, Victoria, and Peter, accompanied him.

One day after supper, when everyone agreed to go for a walk, Cindy suggested that they do a tree walk.


We're studying trees at school; so I can use your help to find different types of trees, and to see how trees are used in our community.

The walk had just begun when Jaydn declared that some trees had needles and others, had leaves. The group decided that the trees with needles were either spruce or pine.

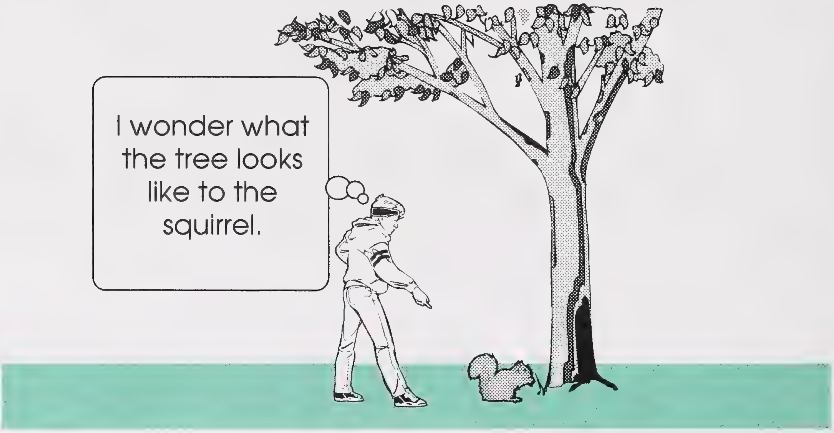
Our neighbourhood has no fir trees; but it has some beautiful blue spruce.

The group found poplar, mountain ash, crab apple, mayday, and Manitoba maple to be the most common trees in the community.

The trees are all different ... we can tell them apart.
Let's look to see how these trees are used.

They discovered that trees are used to make our community more beautiful. A good variety of trees make our homes look better, and make our parks beautiful places to walk, play, and picnic.

As they were coming closer to home, Peter noticed a squirrel on the ground under a tree.


I wonder what the tree looks like to the squirrel.

1. Which two types of trees with needles did the group find?

____

____

2. What types of trees did they find with leaves?

____

____

____

____

____

3. The group decided that trees have some things in common. What makes them all trees? One example is given.

   Example: They have leaves or needles (a kind of leaf).

____

____

____

4. How are trees different? An example is given.

   Example: They have differently shaped leaves.

5. What are four uses of trees in your community or around your home?

6. Draw the picture of a tree as a squirrel might see it if it was on a branch.

A Tree Viewed by a Squirrel

Share your answers with your learning facilitator.

Enrichment

Do either Part A or Part B.

Part A is a regular activity. Part B is a video activity that requires the videotape entitled **Identifying Trees**.

Part A

1. Take photographs or draw pictures of the different trees found in your neighbourhood. Make a picture display.

2. Go to your local library and look for books that have keys for identifying trees. Some examples are as follows:

    - *A Field Guide to Trees and Shrubs*
      Author: George A. Petrides

    - *Native Trees of Canada*
      Author: R. C. Hosie

   Do some research in the books you find to identify the trees in your community. Make yourself a key in which you identify by drawing the leaves or needles, branch structure, and other characteristics for the ten most commonly found types of trees in your community. If it is fall you may wish to include actual dried leaves for some of the trees. Design a notebook or scribbler for this project. You may wish to add to your list as time goes by so as to be able to identify more trees when you are on outdoor excursions or field trips.

Share your answers with your learning facilitator.

Part B

If you decide to do Part B, you must have a videocassette recorder (VCR) and the videotape entitled **Identifying Trees**, which is part of the *Tree Talk Series*.

This videotape helps you to identify trees by looking at their leaves or needles and other parts of the trees. It shows you how to dry leaves, and gives up information about making yourself an identification guide with leaves or leaf rubbings that you may collect.

3. During the season when deciduous trees are without their leaves how can you identify the different types of trees? Give the things you would look for to determine what type of tree you are looking at.

4. Following the instructions in the videotape, start a leaf identification guide of your own during the seasons you may obtain leaves. You may collect and dry actual leaves or do leaf rubbings. As mentioned in the videotape you may wish to use established tree-guide books to help identify some of your samples that you are not familiar with.

Share your work with your learning facilitator.

Conclusion

In this section, you studied the trees in your community to see what kinds of trees grow there. You looked to see how trees have many things in common and how they are different. Then you studied the uses of trees in your neighbourhood.

Next, you used your senses such as touch, smell, sound, and sight to get to know trees more closely.

Finally, you drew trees as if you were seeing it through the eyes of an artist, a scientist, or a bird.

Assignment Booklet

ASSIGNMENT

Turn to your Assignment Booklet and do the assignment for Section 1.

SECTION 2

Ecological Concepts

You eat foods that come from plants and animals to give you energy to live. You have grown in size and strength since your birth, and will continue to change as you mature. As an infant you were completely dependent on your parents and now you can do many things without their help. What do you think your parents or grandparents were like when they were your age? Maybe you've seen pictures of them in a family album and have noticed the changes that occurred over time.

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Nature has a similar pattern. Plants and animals depend on sources of energy to grow and mature, and are later replaced by new members of their species. Their lifespans can vary and so can the amount of change each has to adapt to and endure. All living things in nature depend on different sources to sustain their lives. For example, humans depend on plants, animals, and other humans to live. Plants and animals depend on each other; thus, relationships exists between them.

In this section, you will study how energy flows from the sun to plants so that they can make food for themselves. You will learn how air, water, and materials are cycled for use over and over again. You will learn interrelationships of living things. You will examine how trees change each season, and how they change over time.

ACTIVITY

1 Energy Flow and Interrelationships

Energy Flow

Where does your energy come from? On a typical day you might walk or ride your bicycle to school, help with chores around the house, and participate in sport activities with your friends. The energy you need for these activities comes from the food you eat. That is why you need to eat breakfast, a good lunch, and an evening meal. If you have any pets or live on a farm where animals are raised, you know that animals get their energy from the foods they eat as well. Where does the energy that is in food come from?

Energy flows from the sun to trees and to other green plants. It is the sunlight that gives power to the Earth. It is the light from the sun that powers living things. Green plants use the sunlight to produce food energy by using a process called **photosynthesis**. When the plants are eaten by plant-eating animals (herbivores), the energy is passed on to the animals. The plant eater may in turn be eaten by a meat eater (carnivore); so the energy is passed on again. Omnivores are animals that eat both plants and other animals. Energy flows from one group of living things to another as plants and animals feed on each other to get the energy to grow. Although plants collect energy from sunlight, the plants also need nutrients to grow and to supply the rest of the **food chain**. The nutrients would run out if it were not for another group of organisms that bring them back to the beginning of the food chain. **Decomposers** allow nutrients to be recycled back to the producers.

photosynthesis – the formation of carbohydrates and oxygen with the aid of light in the presence of chlorophyll (photo = light; synthesis = make)

food chain – movement of food energy in an ecosystem from producers to different levels of consumers

decomposers – organisms (bacteria, fungi) that break organic material down to its component minerals

1. In order for plants to produce their own food, where does the energy come from?

2. What important thing must a plant possess if it is going to produce food?

3. a. What does a deer eat to get energy?

   b. What do we call animals that eat this kind of food?

4. List three examples of forest herbivores.

5. List three examples of forest carnivores.

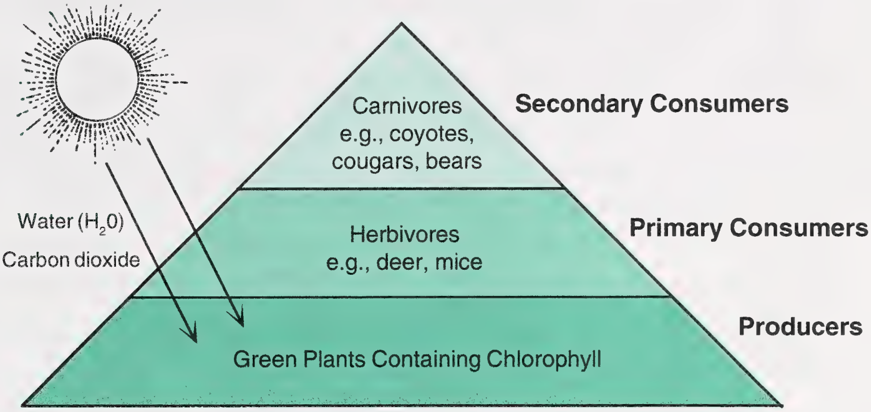
Share your answers with your learning facilitator.

Interrelationships

There is a relationship between the size of a population and its level in the food chain. Consumers depend on all the other organisms before them in the food chain for energy and nutrients. Generally there is a reduction in population as you go up a food chain. For instance, there would be more deer in a forest than wolves or coyotes. A community usually has a higher number of organisms that are eaten than the number of organisms that eat them.

interrelationships – mutual relationships or dependencies

The flow of energy and **interrelationships** among organisms is illustrated in a food pyramid. The diagram is as follows:



6. Why are there more hares, mice, and squirrels than there are cougars in a forest?

____

____

____

____

____

Share your answers with your learning facilitator.

The interrelationships among organisms and nonliving things in a forest ecosystem pertain to the basic needs of the plants and animals found there. Food, reproduction, and shelter needs must be met, or an organism will die. Animals eat plants or other animals for food. The nonliving components of a forest ecosystem (water, soil, and air) are equally important to the community by providing an environment in which all living members of a forest community can live and reproduce.

Trees provide for many needs of other plants, and they provide for many needs of animals including humans. In return, they have some of their needs provided by other plants and animals.

Trees and Other Plants

Trees may have moss growing on their bark or at ground level. Fungus sometimes grow on trees, and lichens (made of algae and fungi) can often be readily found.

Pine trees, and other kinds of trees, have a special relationship with a fungus in the soil. The fungus covers the roots and enables the roots to absorb water and nutrients more easily. The fungus thrives under the trees because it is nourished by organic material released by the tree. Watch for examples of plants growing on trees in your community or while travelling to other places.

7. Look for two examples of moss, fungi, or lichens that depend on trees in your community, and draw or include photographs of them in the spaces provided.

Share your answers with your learning facilitator.

Trees and Animals and Insects

Trees provide for the needs of animals including wildlife and humans. Birds nest in trees and eat fruit, seeds, and insects found there. They find protection in the trees. In return, the birds may eat the insects that are harmful to the health of the tree, or they may help to pollinate the flowers of the tree so seeds can be produced.

Insects, spiders, or other crawlers may make their homes on trees or may eat leaves or other parts of the tree for their food.

Some of the insects, spiders, and other crawlers may be eating the tree, but others may be helping the tree by eating those that are harmful. There is an interesting interrelationship in action on the tree, under the tree, or under the bark of the tree.

Trees provide homes in their branches for squirrels and may provide other mammals with burrows under the tree. They provide habitat where animals live. Humans use the trees for a variety of purposes including shade, shelter, food, combatting noise, sight barriers, and beautification. Humans try to do their share by planting, watering, and caring for trees.

A major contribution of trees is that trees supply oxygen for animals to breathe. Animals help the interrelationship by supplying carbon dioxide for the trees to make food.

8. Look for insects, spiders, and other crawlers on the trees in your community. Check for any that crawl, fly, or nest in the trees. Look for webs, coccoons, eggs, etc. In a paragraph, describe your observations.

9. What does each of the following provide for others in the forest ecosystem?

   a. trees

   ____

   ____

   b. herbivores

   ____

   ____

   c. carnivores

   ____

   ____

   d. insects

   ____

   ____

   e. birds

   ____

   ____

   f. moss

   ____

   ____

   g. bushes

   ____

   ____

   h. decomposers

   ____

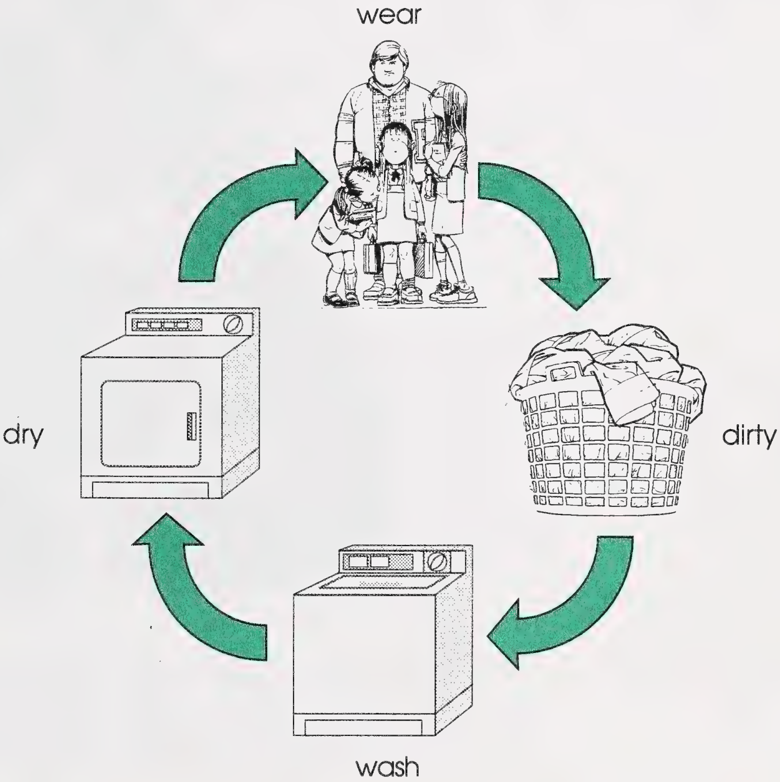
   ____

Share your answers with your learning facilitator.

ACTIVITY

2 Cycling of Materials

Many things in life follow a cycle. For instance, the clothes you wear are involved in a cycle. Look at the following diagram.



The only way the previous cycle will break down for a certain item of clothing is when that item is disposed of.

In Activity 1 you studied that energy flow forms a cycle too. Plants use sunlight and nutrients to produce food. Animals then eat plants, and these animals may in turn be eaten by other animals. You also learned that decomposers give nutrients back to the soil; thus, the cycle is completed, and the food chain is able to continue this cycle.

biosphere – the region of the Earth, including the atmosphere and the oceans, in which life can exist

The **biosphere** is almost a closed system. All it needs to keep going is energy from the sun. Matter that is used by organisms is recycled. You are probably familiar with the water cycle. Air is also recycled. Air is 79 % nitrogen gas. In this form, it is not usable by plants. Lightning and nitrogen-fixing bacteria in the soil changes nitrogen gas to nitrates that plants can use. When plants and animals that eat plants die and decompose, nitrogen gas is again released.

There are other cycles as well. All these cycles are nature's way of recycling. Because of this recycling, the biosphere is almost self-sustaining. No materials have to be added; just energy from the sun is required. In fact, trees play a very important role in the cycling of air, water, and soil.

The Air Cycle

by-product – something produced during the manufacture of something else

Green plants require carbon dioxide to create food energy through photosynthesis. Forests are made of vast numbers of trees and other plants containing chlorophyll that use vast amounts of carbon dioxide. They also produce large quantities of oxygen as a **by-product** of photosynthesis. The oxygen is used by all living organisms (animals and plants included) to break down food in their bodies. This process is called respiration. A by-product of respiration is carbon dioxide, which is released by the organism and taken up by green plants to produce more food and oxygen through photosynthesis.

Therefore when trees produce food using the sun's energy, they also produce oxygen as a by-product which animals use to breathe. In return, animals produce carbon dioxide every time they exhale. The trees utilize the carbon dioxide to make food; thus, the cycle is complete.

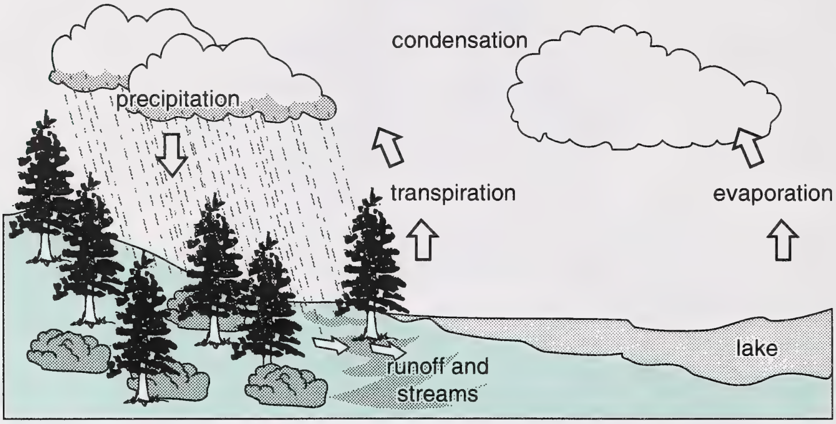
1. Draw a diagram illustrating the effects of the processes of photosynthesis and respiration on the air cycle.

Share your answers with your learning facilitator.

The Water Cycle

transpiration – the giving off of water through the leaves of plants

Moisture falls in the form of rain or snow. It soaks the ground and is absorbed by the roots of plants. The water moves into the cells of the plant and is carried to the leaves where it helps in food production (photosynthesis). Some of it passes from the leaves into the air by a process known as **transpiration**. As the moisture is released from the tree, it rises to form clouds. The water will eventually fall in the form of rain or snow to complete the water cycle.



Set up a demonstration to show that water is given off by plants in a process called transpiration.

A Water Cycle Demonstration

- The materials that you will need include the following:
  - a houseplant
  - a piece of clear plastic or cellophane
  - water
- Water the plant.
- Put the plastic over the plant so that the moisture given off by the plant will stay inside the cover.

2. Use the previous demonstration to answer the following questions.

   a. Describe what you did.

   b. Describe what you observed.

3. The previous demostration is an example of the water cycle. Explain why.

Share your answers with your learning facilitator.

The Soil Cycle

nutrient – the substances serving as food

A tree will eventually die from either disease, age, or a change in the environment. Normally, a tree will decay and rot with the help of plant and animal organisms. The **nutrients** that the tree has collected during its lifetime are returned or cycled back to the soil. The following is an example of the soil cycle.

scavengers – animals that feed on dead organic material e.g., crows, ravens

Fritz, Heidi, and Manny were walking in the forest where they came upon a tree that had fallen years before. The bark was partially rotted and the tree was a reddish-yellow colour. A closer look revealed a hub of activity at the log. When Manny disturbed a piece of bark, she discovered that there was a community of insects active on the surface. It was evident that the log was rotting into the ground. The log was also home for **scavengers** and decomposers who were helping with the cycling of nutrients back into the soil. The tree was slowly becoming part of the soil in the forest.

Nothing in nature is wasted. When a member of a food chain dies, it doesn't immediately drop out of the food chain. Its remains are eaten by scavengers and decomposers. Decomposers break down the remains into their component nutrients while extracting food energy. The nutrients are returned to the environment where they are absorbed by food producers, green plants, and returned to the food chain in an unending cycle.

Have you walked in an area where animals burrow into the ground to make their homes? Ground squirrels, badgers, and moles pile the dirt up near the entrance ways and help in cycling the soil at the same time. Burrowing animals also contribute to the soil cycle by taking plant life below the surface to eat; the remains add to the soil when they break down.

4. Look for signs of burrows in your yard, neighbourhood, community, park, or forest area. Describe what you see. Draw an example.

DRAWING	DESCRIPTION

5. Some trees lose their leaves each fall. Why is this an example of the soil cycle?

Share your answers with your learning facilitator.

ACTIVITY

3 Change Over Time

Have you noticed how things have changed in your life since you were a baby? You are bigger, stronger, more talented, and have developed a lot of different interests over the years. If you look around, you will discover that you were not the only one to change over time. The neighbours may have changed, houses may have new additions built, cars may look different, your family may have new members, or you may have moved from place to place. Change is taking place around you all of the time.

1. List some of the things that have changed since you were in grade one.

Share your answers with your learning facilitator.

Seasonal Change

One of the easiest changes to recognize is how trees change appearance as the seasons change. Deciduous trees are those which lose their leaves each autumn. This is not the only change you can notice. Change takes place in a forest as well. Trees grow taller and thicker as they grow older, some species of plants are replaced by others, animals arrive to live in the changing forest just like new neighbours may arrive in your changing community, and the forest changes as physical conditions change.

2. Trees change appearance as the seasons change. Describe the appearance of a crab apple tree or any other deciduous tree in the spring, summer, fall, and winter. Draw pictures to illustrate the tree in each season. You may use pictures from a magazine if you are able to find some, or use your own photographs.

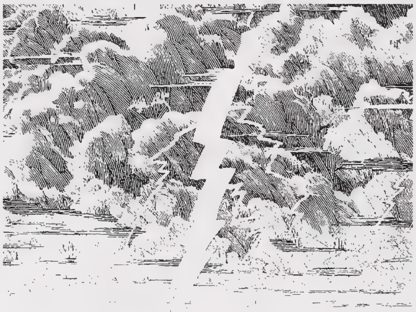
Spring	**Summer**
Fall	**Winter**

Share your answers with your learning facilitator.

Succession

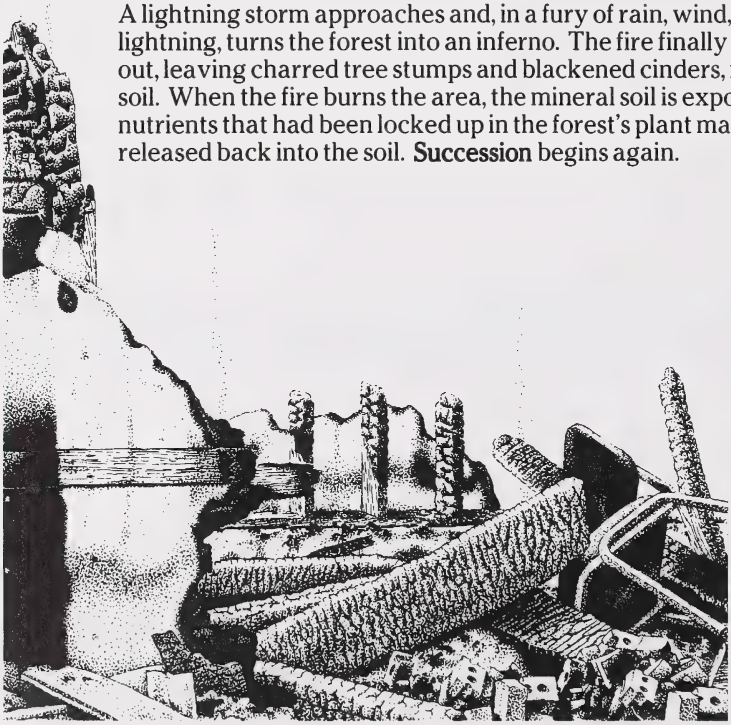
Forests change over time with various species of green plants dominating the area from one time to another.

A forest matures over a period of time until it is a tall stand of spruce trees. The forest floor is covered with moss, grass, flowers, dead and decaying wood, and leaves.



A lightning storm approaches and, in a fury of rain, wind, and lightning, turns the forest into an inferno. The fire finally burns itself out, leaving charred tree stumps and blackened cinders, rocks, and soil. When the fire burns the area, the mineral soil is exposed and the nutrients that had been locked up in the forest's plant material are released back into the soil. **Succession** begins again.

succession – the process of development of plant communities one after the other in a prescribed order



Succession begins with species such as fireweed, aspen, and lodgepole pine competing to be the dominant plant in the forest. Fireweed locks moisture into the soil and aspen trees increase the moisture. Both types of plants protect the soil and seeds lying in or on the ground from erosion.

In the moist, exposed mineral soil and in the sunlight of the regenerating area, lodgepole-pine seeds germinate and grow, shading the fireweed and aspen and causing them to die.

Like fireweed and aspen, pines also need direct sunlight, and cannot grow in their own shade. As a result, the trees that grow in the shade of the lodgepole pines are spruce trees, which have lower light requirements. Over time, spruce replaces pine as the dominant species in a forest. The spruce will grow in an area until there is a fire, an insect infestation, clearcut logging, or other type of disturbance in the forest.

Each change in forest vegetation also means a change in habitat for the animals that live in the forest. As dominant trees grow and die, so do the animals of the forest come and go.

A forest goes through several stages to reach maturity, just as you go through different stages as you grow older. In a forest, the process is know as succession.

3. List the five stages of forest succession as defined by the dominant plant types. Describe each stage, and explain how and why each gives way to the next stage.

Share your answers with your learning facilitator.

Adaptation

In the springtime, garden nurseries are quite busy with people buying plants for their gardens and flower beds. The plants are often accompanied by instructions about where and when it is best to plant them. Some plants grow best if they are planted in the sun and others will thrive better in partial shade. Plants must be able to **adapt** to an environment in order to grow well.

adapt – change to suit changing circumstances or environment

As conditions change in a forest, it becomes difficult for some plants and animals to survive there. When the forest is young, the sun's rays reach all of the plants. Animals are attracted to the area by the amount of young, tender green plants available for food. When the forest matures and the dominant species becomes spruce, the forest floor is shaded, and plants that require lots of direct sunlight die. They are replaced by plants that grow better in shady areas.

The animals must be able to adapt to the conditions in the forest as well. If they are unable to do so, they have to move to another habitat or they may starve or die. Other animals that have adapted to the new conditions in the forest move in to take the place of those that move out.

Mature forests offer more shelter for many large herbivores than young forests do. However, the food supply available for large herbivores in a mature forest is usually less than in a young forest.

4. What would herbivores do in order to have both a mature forest for shelter and a young forest for food?

Share your answers with your learning facilitator.

Physical Change

Sometimes changes in a forest are caused by humans. Pollution, harvesting timber, recreational use for camping, hiking trails, cut lines for power supply, cabins, and golf courses are a few examples of how humans affect forests.

Humans also have the ability to change forests in a more positive way. Some examples include planting trees after an area has been harvested, establishing laws about how forests are to be used, setting aside forests as national parks or forest reserves, and checking forests for disease.

Loss or accumulation of soil and changes in the availability of water are other major influences on a forest.

5. What affects can humans have on forests?

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Share your answers with your learning facilitator.

Follow-up Activities

If you had difficulties understanding the concepts in these activities, it is recommended that you do the Extra Help. If you have a clear understanding of the concepts, it is recommended that you do the Enrichment.

Extra Help

Energy Flow

The sun provides energy in the form of heat and light. On a nice sunny day at the beach or in the park, you will feel the heat and may even have to get out of the sun and into the shade.

The sunlight brightens up the day but it also provides light energy for trees and green plants so they can make food by a process known as photosynthesis. In this process, if sunlight combines with carbon dioxide from the air and the roots absorb water, the leaves can produce food. As a result of this process, oxygen is given off into the air for living things to breathe.

1. The process by which plants make food is called photosynthesis. Write a paragraph describing and explaining what takes place during photosynthesis.

Share your answers with your learning facilitator.

Cycling of Materials

When the air is full of dust, smoke, or chemicals, it's not very pleasant to breathe. What we need is good clean air to breathe so we can be healthy and grow. Luckily, a good supply of oxygen is available thanks to the plants that give off oxygen as a result of the food-making process. Humans and other animals return the favour by exhaling carbon dioxide whenever they breathe. This is the process of air cycling. The carbon dioxide is used by plants to help in the production of food; thus, the cycle is continuous.

Water falls from clouds in the form of rain or snow and is absorbed by the roots of trees. It passes through the body of the tree to the leaves where it passes back into the air by a process called transpiration.

As the trees drop their leaves, the leaves begin to decay until they become part of the soil. This is part of the process known as soil cycling.

2. Find a pile of leaves that have been sitting and rotting for some time and stir them. If you are unable to find some leaves in nature, take some extra leaves from the houseplants in your home and put them in a small box to rot. Record your observations.

   a. What do you smell?

   b. How are the leaves changing?

   c. What is happening to the nutrients in the leaves?

Share your answers with your learning facilitator.

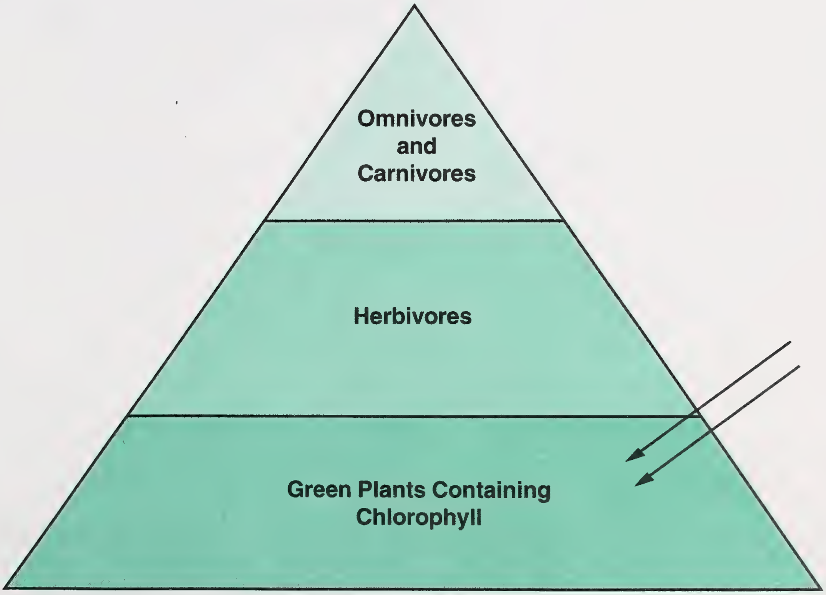
Interrelationships

All living things are interrelated. Animals depend on plants for food, habitat to live in, protection from other animals, protection from the weather, and they depend on plants to provide them with a steady supply of oxygen so they can breathe.

Plants depend on other plants for protection, and they depend on animals to supply them with carbon dioxide, seed dispersal, fertilization, as well as care when they are around homes and communities.

3. Following is a list of animals, plants, and nonliving things that are features of a food pyramid. Place them in the appropriate place on the diagram. Remember that herbivores feed on plants, and that carnivores eat meat. Omnivores are animals that eat both plants and meat.

- grass
- mouse
- deer
- fireweed
- beetle
- raven
- cougar
- squirrel
- woodpecker
- weed's
- grouse
- hare
- humans
- the sun
- carbon dioxide
- water
- coyote
- moose
- aspen
- black bear



Change Over Time

Have you changed very much since your were a baby? Are you heavier, older, smarter, better looking, more skilled? We could say that you have changed over time to be what you are today. Trees change over time just the same way that you have. They may not be smarter, or more skilled but they can become heavier, thicker, and taller as they get older.

4. Vinay planted some evergreen trees in front of his house. The trees were very small so he planted fifteen trees with one tree being planted every metre.

   a. What is wrong with Vinay's planting?

   b. Draw a diagram to show what the trees and the house will look like in twenty years as they change over time.

Share your answers with your learning facilitator.

Enrichment

1. To see how the process of photosynthesis works, choose a tree or larger houseplant. Cover a small section of a branch with aluminum foil so that the leaves are unable to receive any sunlight. Wait for seven days. Remove the foil.

   a. Draw a diagram of your demonstration.

   b. Describe what happened. Did the leaves change colour?

   ____

   ____

   ____

   ____

   ____

   ____

   ____

   ____

2. Design an animal that is able to produce its own food. Remember that it will need chlorophyll just like a plant. Decide the shape, size, colour, and features of your animal. Draw it in the space provided. Write a brief explanation of how your organism produces its own food.

Share your answers with your learning facilitator.

Conclusion

In this section you studied four ecological concepts that are found in the complex forest ecosystem of trees, animals, rivers and streams, bushes, grasses, and other living and nonliving things. First, you studied energy flow and how the sun supplies energy for plants to make food through a process known as photosynthesis. You studied how green plants are a source of food for herbivores which are in turn the source of food for carnivores. You also learned that omnivores eat both plants and animals. The energy is passed from one group to another through the food that is eaten. You learned that all living and nonliving things in a forest ecosystem are interrelated.

Second, you learned the cycling of materials (air, water, and soil). You studied how plants produce oxygen and how they use carbon dioxide. You learned how trees cycle water by using their roots, body, and leaves. Then you learned that dying trees and leaves are part of the soil cycle when they decay to add nutrients to the soil.

Then you learned about change over time as you studied about the seasonal change and the aging of trees. You studied about plant and animal succession as plants and animals replace each other as the habitat changes. You further learned about how plants and animals adapt to their surroundings or must move to new places. Next, you considered the positive and negative effects humans have on the forest ecosystem.

Assignment Booklet

ASSIGNMENT

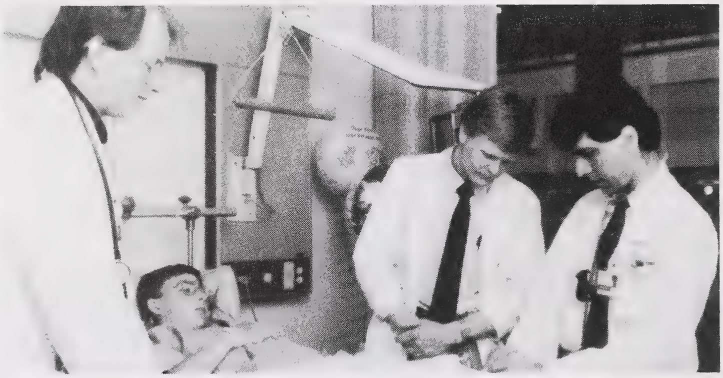
Turn to your Assignment Booklet and do the assignment for Section 2.

SECTION 3

Investigations

Looking at your height, weight, and general appearance, someone could approximate your age. Your height, weight, and appearance could also be used to judge your general health.

To be sure that you are in good health, it is necessary to see a doctor for a checkup. The doctor will check your eyes, ears, nose, and throat, listen to your heart and lungs, check your blood pressure, and may do some other tests.



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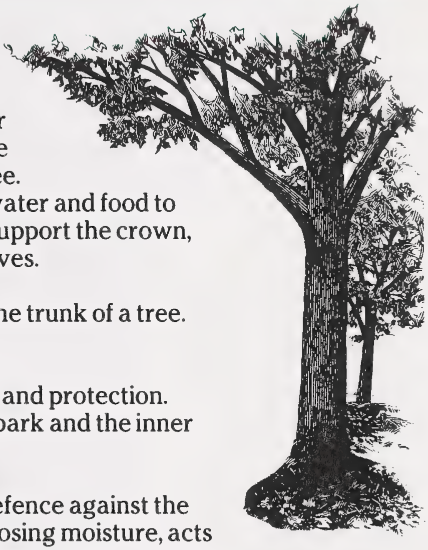
If you were walking through a forest, how would you decide whether or not a tree is healthy? Naturally by looking at the height and general appearance of a tree would give you some idea. To be certain, you would need to do a closer examination much the same as a doctor does when determining your state of health. For a tree you would need to closely examine the bark on the trunk, the leaves, the branches, and other parts of the tree to fully assess its health. If you look around you to discover all the items made from wood or things produced from other parts of trees, you will know why it is important to maintain healthy forests. This section will provide an opportunity to find out more about forests and forest products.

In this section, you will collect information about trees as to their type, age, height, and other factors. You will use a special survey to do a medical checkup of a tree. You will also use your investigation skills to obtain more information about forest products.

ACTIVITY 1

Determining a Tree's Age



Two small leaves supported by a tiny stem emerge from the soil. The leaves and the stem grow rapidly and the tree seedling forms. As growth continues from year to year, the stem grows longer and thicker and becomes the trunk of the tree. The trunk forms the body of the tree. Its purpose is to provide a pathway for water and food to move between roots and leaves and to support the crown, which includes the branches and the leaves.

There are different parts that make up the trunk of a tree. Each part serves a purpose.

The bark is responsible for food transfer and protection. There are two layers of bark: the outer bark and the inner bark.

The **outer bark** is the tree's first line of defence against the environment. It prevents the tree from losing moisture, acts as an insulator against extreme cold and extreme heat, and provides protection from damage by insects and fungus plants. In some of the older trees, for example the Douglas fir, the outer bark is very thick and contains cork cells. This gives the tree excellent protection against fire since this thick bark will not burn easily.

The **inner bark** is quite soft, moist, and helps prevent loss of moisture from the tree. This bark is made up of special cells called phloem cells. They are responsible for conducting the food manufactured in the leaves to other parts of the plant for storage or use by other cells. Once the outer layers of this inner bark die, they form cork which then becomes part of the outer bark. In addition, the inner bark helps the outer bark protect the tree.

The **cambium cell layer** is a thin layer of cells located between the inner bark (phloem) cells and the sapwood (xylem) cells. The cambium's function is to form new cells on the outside to add to the inner bark (phloem), and new cells on the inside to add to the sapwood (xylem). Each year this growth layer of cells produces new wood and new bark.

The **sapwood** lies next to the cell-producing cambium layer of cells. The layers of sapwood nearest the cambium layers contain living cells called xylem, which carry water from the roots to the leaves. Each year new layers of sapwood are produced and it is the uneven rate of production of these layers of cells which create the rings of wood you see in a cross section of a log. One ring is produced each year. The inner layers of the sapwood eventually cease to function and thus form part of the inner core of the tree which we call the heartwood.

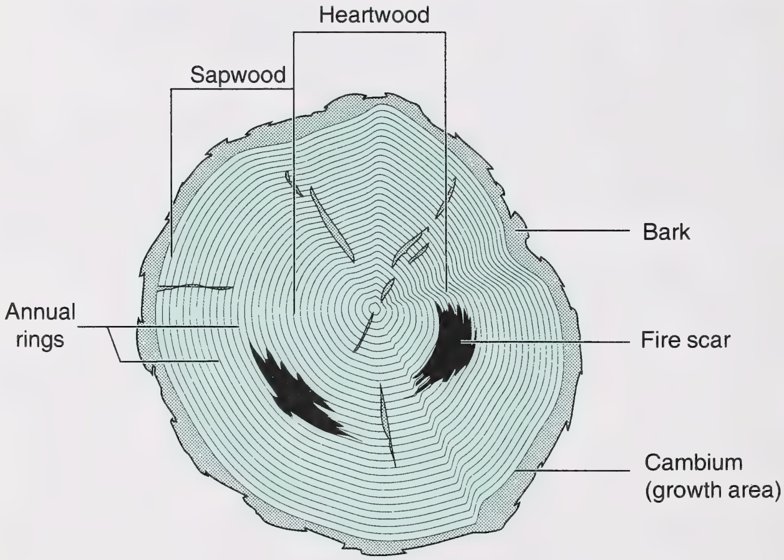
The **heartwood** is made up of layers of dead sapwood cells. These heartwood cells become filled with a substance called lignin as well as other compounds such as tannin, pigments, gums, and resins. These cause the heartwood to become darker in colour and make the wood more resistant to decay. The inner core of heartwood adds strength to the tree and also forms the supporting pillar for it.

Wood produced by the tree is essentially made of heartwood and sapwood, and these two parts of the tree trunk form the major portion of the volume of the trunk.

Some trees live for a long time if they are protected from diseases, fire, and insects. Conditions must be just right for a tree to grow old.

By studying a cross section of a tree, it is possible to tell something about the life of a tree. The following cross section shows the age of the tree. Each year a new annual ring is added just beneath the bark.

Cross Section of a Tree



1. Answer the following questions using the previous diagram.

   a. How old is the tree?

   ____

   b. How many years ago did a fire scar the tree?

   ____

2. Find a piece of firewood that is round. Make sure that the annual rings can be seen. A light coating of vegetable oil will enhance the rings.

   a. Draw a diagram of the end of the wood.

   b. How old was the tree when it died?

   ____

Share your answers with your learning facilitator.

ACTIVITY 2

Eco Checkup of a Tree

How do you determine how healthy a tree in a forest is? Just as a doctor looks at your general appearance and then does some closer examinations, you can also look at a tree's general appearance and then check out the tree more closely. A doctor examines your eyes, ears, throat, and other parts of your body to determine your health. For a tree you need to examine the trunk, the branches, the leaves, and other parts of the tree. There are illnesses and diseases that may affect your health. Similarly, a tree's health can be affected by diseases and damage by certain insects.

The forests are home to thousands of species of insects. Many of these are beneficial and many are destructive. Consider those that are destructive and ruin much of our valuable forests. Forest trees are constantly attacked by insects. Some damage very young seedlings; some ruin young trees by attacking the cambium cells; and some infest the roots, the seeds, the leaves, or the bark.

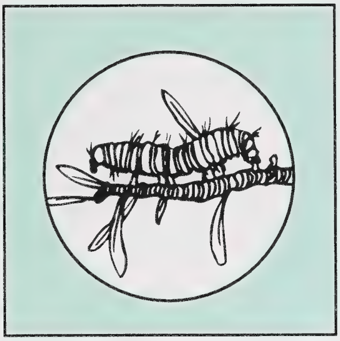
Insects pass through four stages in their life cycle: the egg, larva, pupa, and adult. The larval stage is often the stage in insect development which causes the greatest damage to forest trees. Under normal conditions very few of the thousands and thousands of eggs laid by a female insect produce young that eventually reach the adult stage. Their numbers are kept in check by natural enemies such as birds and other insects. However, once in a while conditions change and, for some reason, the natural checks fail to work; thus, many more insects than normal are produced. It is at times such as this that the excessive numbers of insects cause so much noticeable damage.

Insects may be grouped according to the kind of damage they do.

There are bark beetles, which bore through the bark of a tree to feed on the live phloem, cambium, and xylem tissues. There are also defoliators which are insects that strip a tree of all its leaves or needles. Therefore, the tree is unable to carry on photosynthesis.

You may also check for leaf miners, which are insects whose larva eat the food-producing tissue in the center layers of leaves.

Bark beetles are very destructive. This type of insect enters the tree and bores long, winding tunnels in the living tissue just under the bark. Eggs are laid in these tunnels and when they hatch, the new larvae bore tunnels of their own. Eventually they emerge as adults and move to other trees to continue the life cycle. Trees are killed as a result of bark beatles eating the living tissue under the bark.



Defoliators cause much damage to trees. Their damage is much more obvious since it is easy to detect trees with no leaves. Larvae of defoliators simply eat all the leaves or needles of a tree. If this happens for a few years in a row, the tree will die because it is unable to manufacture food. If the tree does not die as a result of defoliation, then its development will at least be severely retarded. The spruce budworm, the hemlock looper, the spruce and larch sawflies, and the forest tent caterpillar are examples of insects that defoliate trees.

Leaf miners are insects that lay their eggs on the leaves or the needles of a tree. When the eggs hatch, the larvae enter the leaf and eat the food-producing cells. Leaves of aspen trees or birch trees which contain leaf-miner larvae are easily noticed because they have brownish winding designs on them or what appears to be a brown blotch on it. The birch sawfly is an example of such an insect. If infestations are very serious for several years in a row, then the growth of the tree may be adversely affected.

Most tree diseases are caused by fungi; some are caused by unseasonably extreme weather; and a few are caused by parastic plants. Only a relatively few diseases are important in terms of the amount of damage they cause. Some diseases to watch for include heartrot, heartwood stain, stem cankers, dwarf mistletoe, and foliage diseases.

Heartrot is the most common and destructive of all forest diseases in Alberta. It is caused by any of a closely related group of fungi that enter trees through wounds anywhere on their roots and stems. Once established in the heartwood of trees, these fungi continue to grow, living on the tissues that are collectively called rot or decay. Heartrot is slow to develop; but if infections take place when trees are young, the amount of rot will be considerable when these trees have reached mature sizes. Trunk scars and root scars are favoured points of entry for heartrotting fungi.

Heartrot stains are caused by fungi that are rather similar to those causing heartrot; the difference being that stain fungi does not cause the total destruction of heartwood. These fungi also enter trees through scars.

Stem cankers occur everywhere in the province, but are more common in some localities and on some species. Pine, spruce, and aspen are particularly susceptible to this form of disease. Cankers are also caused by fungi, but a different group from those that cause heartrot and stains. Canker fungi invade the living portions of stems and branches; and once established, many of them persist for the life of the tree.

Dwarf mistletoe is a plant parasite that grows on and within the woody parts of coniferous trees (mainly pine). Once established, it produces an annual cluster of branches and seeds that grow out of a persistent root system that is embedded within the affected tree. The stems and branches of severely affected trees bear thousands of individual mistletoe plants. Since all of the nutrients for these plants are derived from their host trees, the resulting affect is one of malnutrition through starvation on the part of host trees. Consequently the tops of older trees are often killed.

Foliage diseases affect all trees that are native to Alberta, but on the whole are not believed to cause serious or permanent damage. They are caused by either a special group of fungi or by weather. Most of the fungi that cause foliage diseases require special conditions for their widespread development. These conditions can be supplied by a reduced state of tree vigour, or by unusually warm and moist summer weather. Some foliage diseases are caused by adverse weather alone, such as drought or unseasonal frosts. Whatever the cause, the net effect of foliage diseases is a general weakening of trees and a loss of growth.

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Select a tree; then play the role of a tree doctor. Do a complete examination of the tree on the following forms. Give as much information as possible. This will vary depending on the season you complete this checkup.

THE TREE CENTRE
Confidential Tree File

Photograph or Drawing:

Kind of Tree:

Type (circle):

conifer deciduous

Address or Location:

Height (metres):

Trunk Circumference (distance around the tree) at One Metre:

Age (approximately):

Physician's First Impression of Tree (circle):

healthy nice appearance likeable some concerns injured

Description or Comments:

Date ____________________ Physician(s) ____________________

____

Trunk Examination

Bark (circle):

smooth rough loose or flaky ridged thick
thin white green black reddish
comments:

Injuries (circle):

yes no
cracks cuts scars seams other
comments:

Growths on Trunk (circle):

yes no
moss lichen fungus other
comments:

Sap Showing (circle):

yes no
drops oozing hardened yellow smelly
comments:

Animal Signs (circle):

yes no
insects insect holes woodpecker holes nest other
comments:

Trunk Leans (circle):

yes no
slightly a lot
comments:

Roots Showing (circle):

yes no
comments:

Ground Around Base (circle):

bare grass leaves needles cones
wet dry snowy
comments:

Branch Examination

Branch Distribution on All Sides of the Tree (circle):

even uneven

comments:

Branch Posture (circle):

horizontal downward sag upward bend tips turn other

comments:

Top Branch or Leader (circle):

single double straight crooked drooping

comments:

Branch Condition (circle):

healthy dead broken needs pruning

comments:

Buds (circle):

present not present

Diagram (if present)	Leaf scar design diagram
comments:	comments:

Leaf Examination

Type (circle):
leaves needles

Size (circle):
small medium large

Shape (circle):
round heart arrow pointed other
smooth edge jagged edge
comments:

Arrangement (circle):
single grouped other
comments:

Colour (circle):
green red yellow other
light medium dark bright
comments:

Disease (circle):
healthy bumps (galls) spots other
comments:

Insects (circle):
present chewed areas eggs burrows other
comments:

Leaf Rubbing:

- Choose a leaf (typical size and shape).
- Place a paper on top of the leaf and rub the paper with a crayon or a very soft and dry colouring device.

(Attach leaf rubbing in the space provided.)

Share your answers with your learning facilitator.

By examining the trunk, the branches, and the leaves, you will have a good idea of the tree's state of health. You may wish to examine the same tree during a different season to note the changes. If it is winter, the deciduous tree will not have leaves, but you may find some leaves on the ground below the tree. When you learn about the different products and things that trees provide in the next activity, you will be more aware of why it is important to maintain a good supply of healthy trees.

ACTIVITY

3 Wood and Wood Products

Have you ever considered how dependent you are on forests for different products and items? How would your life be different without wood or other products made from trees?

When you look around your home it is easy to recognize the wood products used to build the homes, the cupboards, the cabinets, and the furniture. Poles, posts, pilings, railway ties, and decks may exist outside the home, and all are wood products.

Wood is used in the construction of some musical instruments, sporting goods, handles for tools, pencils, and many other items you might use - some as tiny as toothpicks.

Wood fibre is used to make paper. Paper products you should be able to find include newsprint, books, wrapping paper, writing paper, paper bags, and wall paper. Don't forget about heavier paper products such as those used for file folders and cardboard for boxes. Although technology has introduced desktop computers and fax machines into offices, can you imagine an office without paper and paper products?

The wood from trees is broken down into pulpwood, cellulose, and lumber. Many items can be made from the pulpwood and cellulose. Paints, lacquers, turpentine, dyes, and a variety of explosives are made from these wood products. Cellulose, which is easily recognized in cellophane, is also used to make rayon (used to make clothing). Cellulose is also present in a variety of other items including photo film, molded plastics, shatterproof glass, and even imitation leather.

Besides wood and wood products, trees also provide food and things you may drink. You likely eat apples, oranges, and other fruits. Certain trees provide us with coffee, tea, maple syrup, and a variety of nuts. The sap from certain trees can be used to make chewing gum; different parts of various trees can be used to make many of our medicines. As a concerned environmentalist you may be aware of this as one reason for preserving the world's rain forests. There are many drugs and medicines that come from trees in the rain forests. For example, the bark of the cinchora tree is used to make the drug quinine, which is useful when combating fevers.

1. Use your investigation skills of reading or interviewing to decide which of the following come from trees (wood or wood products). Cross out the ones that do not originate from trees.

toothpicks
paint
dyes
cabinets
poles
hamburger
landscaping ties
imitation leather
pencils
wallpaper
roof shingles
vinegar
rayon
nails
posts
maple syrup
cupboards
gum
tool handles
photo film
explosives
molded plastics
chalk
nuts
fruit
musical instruments
shatterproof glass
furniture
cardboard
pilings
peat moss
wrapping paper
medicines
books
skis
cellophane

2. Use the list in question 1 to help you investigate the forest products found in and around your home. Look for products not included on this list. Name five forest products that are not listed.

3. How would our lives be different without the products that come from forests?

Share your answers with your learning facilitator.

Follow-up Activities

If you had difficulties understanding the concepts in these activities, it is recommended that you do the Extra Help. If you have a clear understanding of the concepts, it is recommended that you do the Enrichment.

Extra Help

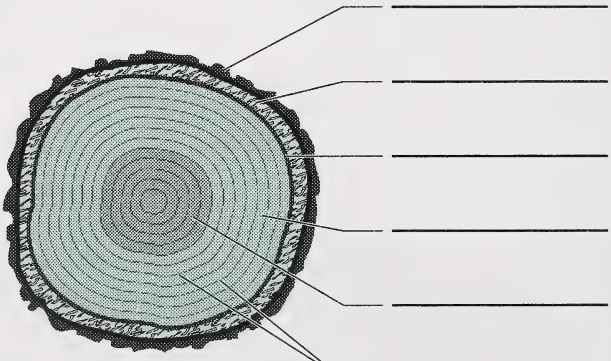
In this section, you have been learning about trees. You have studied the parts that make up the trunk, how to examine a tree to determine it's health, and what wood and wood products provide. Review the notes in activities 1 to 3 carefully; then do the following questions.

1. Match the following terms and definitions. Put the letter of the correct definition beside the term.

_______ a. outer bark
_______ b. inner bark
_______ c. cambium
_______ d. sapwood
_______ e. heartwood
_______ f. annual rings

i. inactive centre of the tree; support column
ii. outer portion of wood; carries water and minerals from the roots up to the crown
iii. conducts food from the crown down to the rest of the tree; phloem
iv. shows the age of a tree as it marks each year of growth
v. protects the tree's trunk
vi. growing cells; the inner layer becomes wood, the outer layer becomes bark

2. Using the six parts of the tree trunk given as terms in question 1, label the following diagram.



The wood from trees provides about 5 000 different products, As you learned in Activity 3, many products that you use come from wood or are wood products.

3. Look through your home, and find items that come from trees and items that are wood products. To make it more interesting, keep a record of the items you find in an alphabetical list. Try to make your list as complete as possible. A few examples are given.

A ____________ B ____________ C ____________
____________ ____________ ____________

D ____dye____ E ____________ F ____________
____________ ____________ ____________

G ____________ H ____________ I ____________
____________ ____________ ____________

J ____________ K ____________ L ____________
____________ ____________ ____________

M ____________ N ____________ O ____________
____________ ____________ ____________

P ____________ Q ____quinine____ R ____rayon fabric____
____________ ____________ ____________

S ____________ T ____________ U ____________
____________ ____________ ____________

V ____________ W ____________ X ____________
____________ ____________ ____________

Y ____________ Z ____________
____________ ____________

Share your answers with your learning facilitator.

Enrichment

Do either Part A or Part B

Part A is a regular activity. Part B is a video activity.

Part A

1. You have used your investigation skills to study the products that come from the trees in the forest. Look in a catalogue or a magazine and find some forest products. Make a display of some of the pictures that you find by placing them on a large piece of cardboard. Label the display **Forest Products**.

2. Keep your records of the medical eco checkup from Activity 2. Do the eco checkup again on the same tree after there has been a distinct seasonal change. How do the records compare? Write a paragraph discussing how the second checkup is similar and/or different from the first checkup.

Share your answers with your learning facilitator.

Part B

If you decide to do Part B, you must have a videocassette recorder (VCR) and the video entitled **Using Trees**, which is part of the *Tree Talk Series.*

This video looks at the different items and products that come from trees including things such as apples and dyes. It also reviews the purposes trees serve in our lives such as acting as fences, barriers, providing beauty, and others.

From the video, you will learn how parts of a tree can be used to make dyes. Use the information learned, with the supervision of an adult, and make a dye of your own. Answer the questions that follow about your dye-making experience.

3. What part of the tree did you take material from to make your dye?

4. What steps did you take in making the dye from the material you obtained?

5. What is the colour of the dye you made?

6. If you want your dye to stick to clothing fabrics, what can you add to get the material to hold this colour?

Share your answers with your learning facilitator.

Conclusion

In this section you learned about the parts of a tree trunk and the purpose each serves in a tree's life. You learned to take a very careful and detailed observation of trees by following a medical eco checkup form. You noticed that the medical eco checkup is somewhat similar to a medical checkup that you would experience with your family doctor. You collected information about the type of tree, its age, its height, and so on.

You also developed and refined your investigation skills. This started with investigating products, using various items in your house and furniture that come from trees.

Your were also required to consider what your life would be like if you did not have wood or wood products.

Assignment Booklet

ASSIGNMENT

Turn to your Assignment Booklet and do the assignment for Section 3.

SECTION 4

Empowerment

During the summer of 1980, Terry Fox ran over 5000 km across Canada on one good leg and one artificial leg. Although he had cancer, Terry refused to let his spirit be conquered by resentment, fear, or hopelessness. He became a symbol of hope in his quest to raise money to conquer cancer. Terry Fox died on June 21, 1981; but his efforts inspired millions of Canadians. Each year many towns and cities across Canada have a Terry Fox run, which people run to raise money for cancer research. This way the commitment Terry had still lives.

VERN KOESLING

Who do you know, other than Terry Fox, that has made a personal commitment to action. Are there any causes or concerns that you are personally committed to? The commitment that you or others have or show may not be as great as the commitment Terry Fox had, but it is still important if it is for a good cause. You may be aware of some groups who are committed to such issues as the environment, people's rights, and government matters.

It is time for some commitment to action on your part. You have studied about trees, ecological concepts, and how to improve your investigative skills to search information.

With your knowledge and skills, you have been empowered to make some personal choices that could affect your home, community, country, and the Earth.

In this section, you will set up an interpretive nature trail and conduct a tour of one or more family members, friends , or neighbours. You will learn some important reasons for conservation of forest products and study about four ways of keeping the raw materials of the forest from dwindling at a rapid rate. The actions include four words that start with the letter R. They are **Refuse, Reduce, Reuse**, and **Recycle**.

ACTIVITY

1 The Tree Trail

interpretive trail – a trail with signs or guides that explain what is around it

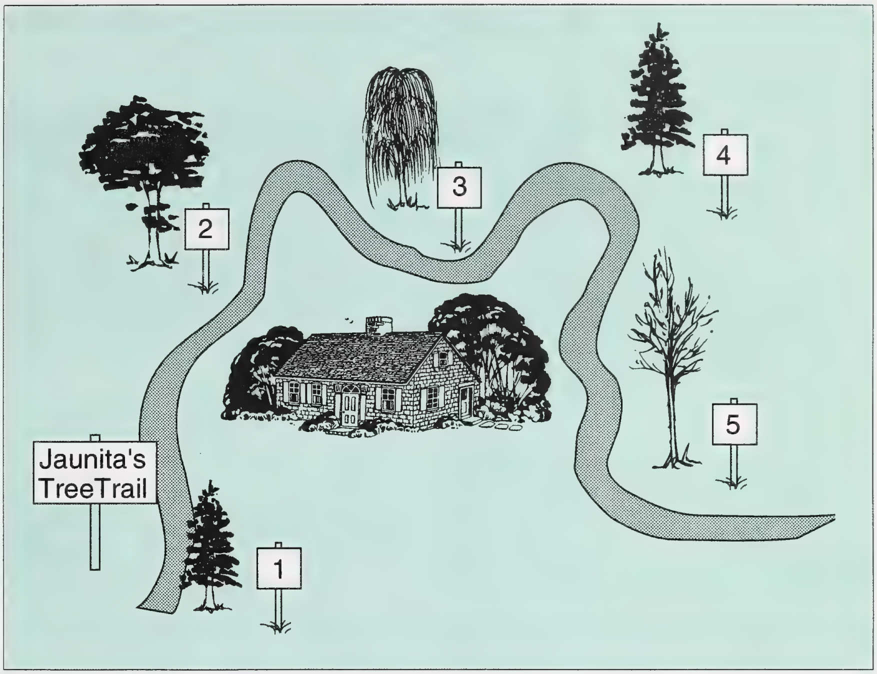
trail guide – a book that provides detailed information about trails

National and provincial parks often have nature trails with signs that tell you about special features. They may include land features, names of lakes and streams, plant life, etc. Take a walk on an **interpretive trail** if you get a chance. It will help you to make a trail of your own.

By now, you should be familiar with the trees in your community. Even in cities you will find trees in such places as parks, backyards, cemeteries, and along streets. You will be using your knowledge of the trees in your community to set up an interpretive trail and develop a **trail guide** that can be used by your friends or family members.

Some of the steps in developing your own tree trail include the following:

- Survey your yard, park, and so on to choose a setting for the trail.
- Choose a place where there are several kinds of trees.
- Choose some good examples to talk about (special, odd, or unusual trees).
- Make some numbers to place in the ground or hang on the trees.
- If it is hard to see the trail, use some coloured cloth, ribbon, or tape to make the trees stand out.
- Make a trail guide that includes the numbers with a description next to each number.



Some of the things that could be a part of your trail include the following:

- any of the trees in your community
- purpose of trees (hedge beauty, etc.)
- parts of trees (leaves, trunk)
- evidence of disease or injury
- details of age, height, circumference
- change of trees by seasons and age
- air cycle and trees
- water cycle and trees
- examples of wildlife found there (birds, squirrels, insects)
- interrelationships of trees and wildlife

1. In a scrapbook, draw a diagram of your trail.

2. Complete the following chart that outlines features you included in your trail. A possible example is provided for you.

TRAIL FEATURES		
#	**Feature**	**Description**
Example	Mountain Ash Tree	clumps of red berries in the fall that attract waxwing birds
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

3. List the names of the people you took on your trail.

____

____

____

____

Share your answers with your learning facilitator.

ACTIVITY

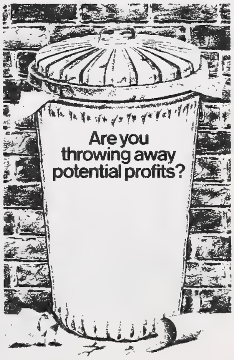
2 Taking Action

In Section 3, you learned about many products that come from the forest.

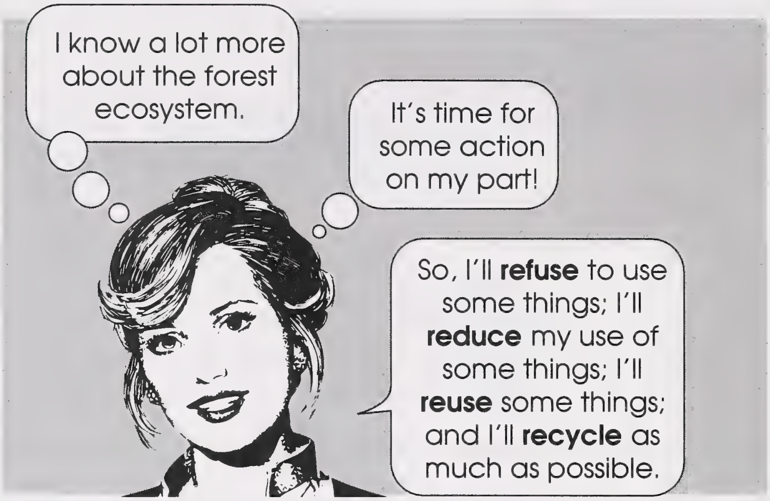
Products we use begin as raw materials. It takes large amounts of energy to transform raw materials into the things society uses.

Many of these products are used by you on a daily basis, but how wisely do you use them? Do any of them end up in the garbage? Could any of them be used again by you or someone else? Could they be used in a different way or for a different purpose? Could someone recycle them to make new products?

Manufacturers use a lot of energy to make the products. One reason for finding alternatives to throwing everything in the garbage is to save energy. Futhermore, it costs billions of dollars to collect garbage, and many items could be used again.



If you are committed to taking action, there are a few ways that you can make a difference. You have no doubt heard the bad news concerning the environment regarding issues such as the depleting ozone layer, global warming, pollution, and the need for landfills. You will now learn about ways in which you can help to improve the situation.


I know a lot more about the forest ecosystem.
It's time for some action on my part!
So, I'll **refuse** to use some things; I'll **reduce** my use of some things; I'll **reuse** some things; and I'll **recycle** as much as possible.

Refuse

Sheila's parents are concerned about the alarming rate of trees being harvested to make paper and paper products. Lately, they watched several programs on television about the environment, and were astounded to see how many trees were required to print one newspaper. They discussed the matter with their neighbours and decided to share a newspaper so they would use less paper and, therefore, have less effect on the supply of trees. This is an example of refusing to use some things.

1. The O'Leary family had a long discussion about whether to buy a real Christmas tree or an artificial tree. Barbara liked the smell of real trees, but Avis wanted an artificial one because it could be used over and over.

a. What other advantages are there to having an artificial tree?

b. What are some disadvantages of having an artificial tree?

2. Anna was shopping with her sister. They wanted to buy some mountain mix (peanuts, raisins, coconut, and seeds) to take on a hike to a nearby forest reserve. They had a choice of buying some packaged mountain mix or buying some mix in bulk form.

   a. What is the wise environmental choice? Why?

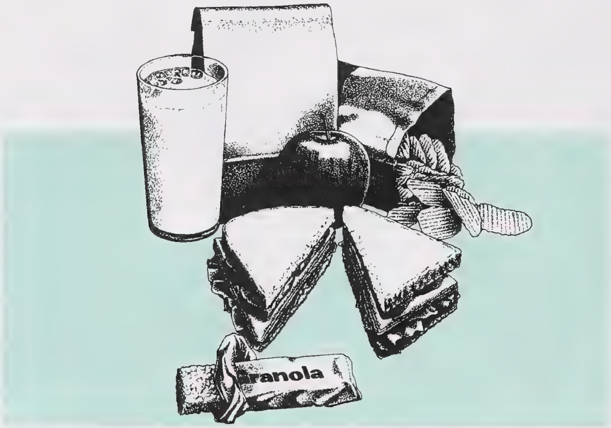
   b. Why is this an example of refusing to use some things?

Share your answers with your learning facilitator.

Reduce

A second way of conserving forests is to reduce your use of a product.

> Lanna, Mick, Anthony, and Soona are friends learning how to care for forest ecosystems. As a commitment to personal action, they decided to reduce their use of some products. They all took their lunch to school in a brown paper bag, which was tossed into the garbage when they were finished eating.



> "We should try to have a garbage-free lunch," said Lanna.

3. List five things you would have to do in order to have a garbage-free lunch.

   ____

   ____

   ____

   ____

   ____

4. List five ways to reduce the use of brown bags.

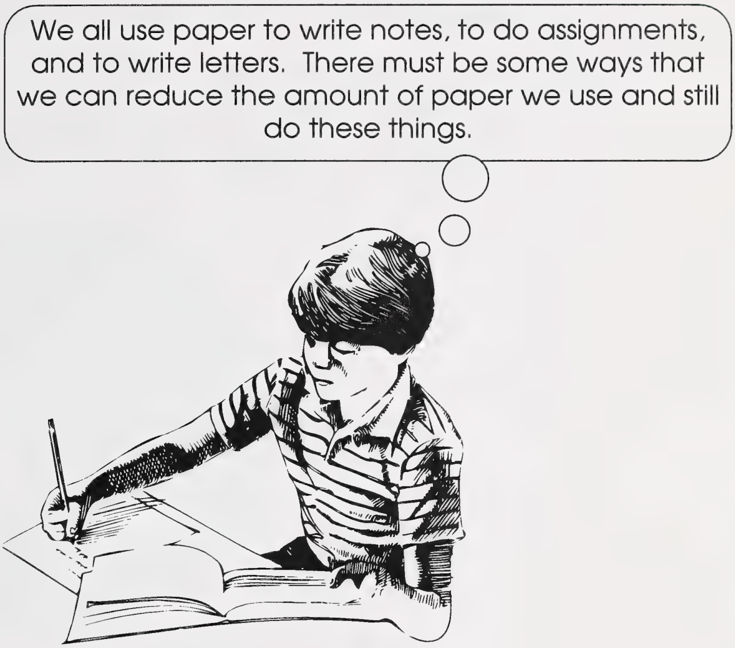
   ____

   ____

   ____

   ____

   ____

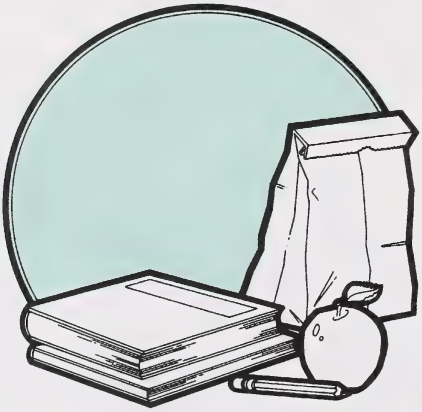

We all use paper to write notes, to do assignments, and to write letters. There must be some ways that we can reduce the amount of paper we use and still do these things.

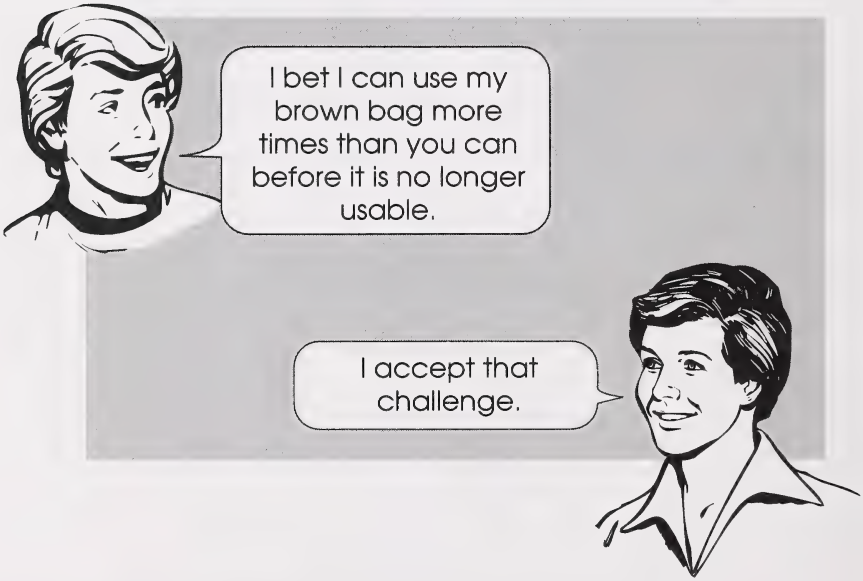
5. List five ways in which you can reduce the amount of paper you use.

Share your answers with your learning facilitator.

Reuse

Eric was in the habit of taking a brown paper bag to carry his lunch to school each day. He would finish his lunch, crumple up the bag, and deposit it in the garbage pail before going to study or play. His friend, George, did the same until one day he suggested that they have a contest.




I bet I can use my brown bag more times than you can before it is no longer usable.
I accept that challenge.

Both Eric and George began taking care of their brown bags each day.

This is an example of reusing something over and over instead of throwing it away.

6. Explain how each of the following items can be reused.

   a. plastic cottage cheese or sour cream containers

   ____

   ____

   ____

   b. glass milk bottles

   ____

   ____

   ____

   c. tin foil

   ____

   ____

   ____

   d. envelopes

   ____

   ____

   ____

   e. paper printed on one side

   ____

   ____

   ____

   f. lumber from a demolished house

   ____

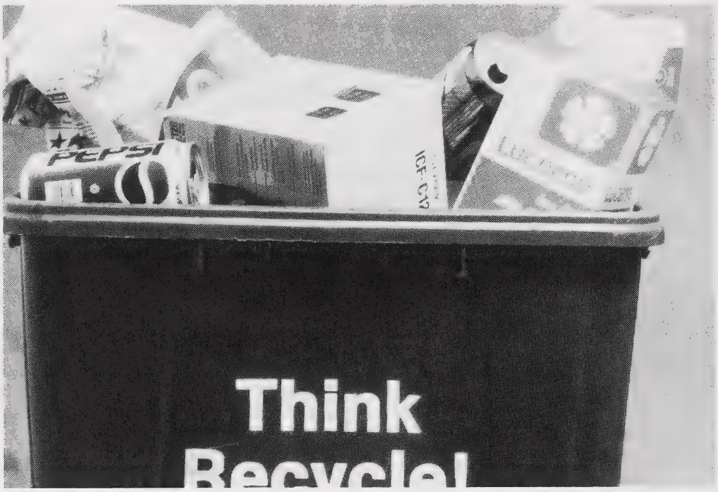
   ____

   ____

Share your answers with your learning facilitator.

Recycle

Vladi's community had lots of volunteers working on a recycling project. There was a blue box program where trucks came on a regular schedule to collect bottles, cans, paper, and plastic. Volunteers were often seen at the community centre sorting the various items.



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Vladi also had regular notices about recycling. There were articles on recycling in the community news bulletin, and there were speakers at community and school meetings explaining the importance of recycling.

When Vladi investigated recycling, he found out some interesting facts. He made the following notes in his journal.

- Recycling saves energy that would have been used in producing the products that we use.
- Recycling reduces air pollution due to manufacturing. Forests help to control air pollution when they are left standing. Trees use carbon dioxide so they are an important part of the air cycle and the flow of energy.
- Recycling increases the time it takes to fill up a **landfill** site.
- Recycling provides materials for new products.
- Recycling reduces the amount of garbage.
- Recycling paper saves trees, which reduce water pollution and soil erosion.
- Recycling prevents the need to use all of the forests for forest products. As a result, habitat for wildlife is protected as well as the beauty of the wilderness.
- It takes a lot of energy to make paper from a tree. It takes 25% less energy to make paper from recycled paper.
- Recycling creates new job opportunities since new industries will be created.

landfill – a constructed hole in the ground into which garbage is dumped for storage

7. As a research project, collect and read at least three articles on recycling paper. Some sources for articles include newspapers, magazines, and community newsletters. Attach the articles (or photocopies of them) in the space provided.

8. Make a list of things collected for recycling that are made from paper.

9. How does recycling paper save trees?

10. How does recycling paper save energy?

Share your answers with your learning facilitator.

Follow-up Activities

If you had difficulties understanding the concepts in these activities, it is recommended that you do the Extra Help. If you have a clear understanding of the concepts, it is recommended that you do the Enrichment.

Extra Help

Review the notes in the activities carefully. Recall how you set up an interpretive trail in your neighbourhood.

Now, you are going to set up an interpretive trail using forest products as the items on the trail.

1. a. Make a checklist of ten items found in your home that are made from forest products.

   ______________________ ______________________

   ______________________ ______________________

   ______________________ ______________________

   ______________________ ______________________

   ______________________ ______________________

   b. On a sheet of paper or small card, write a short description of each item. Describe which type of forest product the item is.

   c. Put a number on the other side of the card.

   d. Set the cards on the items to be viewed on the interpretive trail.

   e. Take others on a tour of your interpretive trail. If possible, let your learning facilitator follow the tour.

2. The Quintanilla family uses paper serviettes during every meal. They go through a lot of serviettes because they are a big family.

   Suggest how the Quintanilla family can reduce their use of paper serviettes.

   ____

   ____

   ____

   ____

   ____

3. If you take lunch to school or have a parent who takes lunch to work, try the following.

   Use a paper bag over and over for lunch. How many times can you use it before it is no longer usable?

   ____

4. Make a scrapbook collection of articles on refusing, reducing, reusing, and recycling.

Share your work with your learning facilitator.

Enrichment

Do any or all of the following:

1. Set up a nature trail (Activity 1). Then, use a camera to photograph the features of the trail. Use the pictures of your nature trail to set up a trail guide in a photo album.
2. Visit a landfill site. What do you see? Could anything be reused or recycled? Write a report of your visit and your ideas in your journal.
3. Find examples of products that are made or printed on recycled paper. List them here.

4. If your community has a recycling program, interview a community leader about recycling. Write up a report on your interview.

5. Write a letter of congratulations to someone or some company that is involved in recycling. Make sure that your letter stresses the positive things the person or organization has done for the environment.

Share your work with your learning facilitator.

Conclusion

In this section, you learned how to set up an interpretive trail, and develop a trail guide, which includes descriptions of various features of interest. Finally, you took your family members, friends, or neighbours on a tour of your interpretive trail. You learned about the personal actions that you could take to affect your lifestyle, home, community, country, and the Earth.

You studied four words that start with the letter R. They were refuse, reduce, reuse, and recycle.

Your learned that to conserve our forests you should

- refuse to use some things
- reduce your use of some things
- reuse some things
- recycle whenever possible

Assignment Booklet

ASSIGNMENT

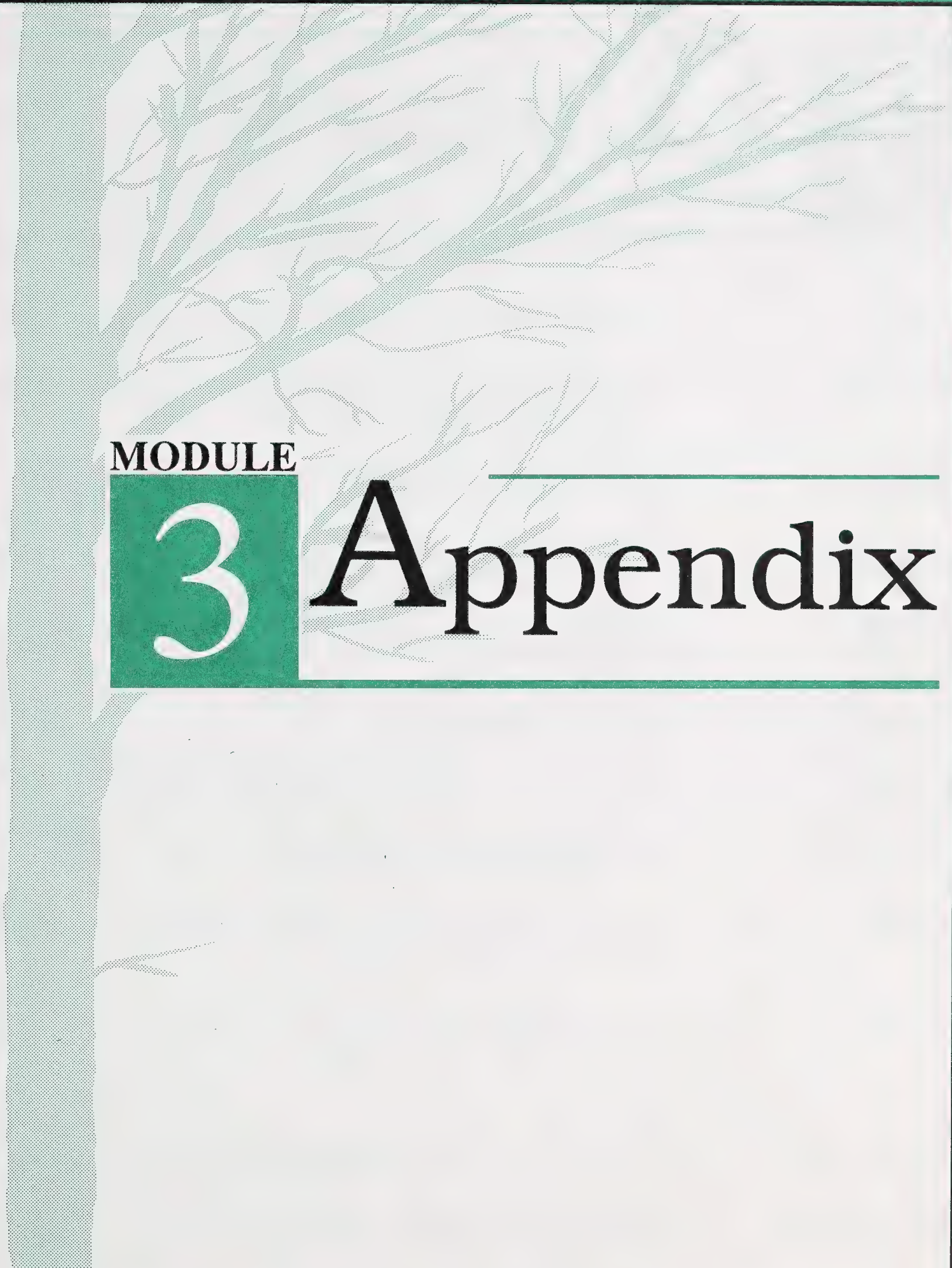
Turn to your Assignment Booklet and do the assignment for Section 4.

MODULE SUMMARY

In Module 3, you began by studying the trees in your community. The purpose was to increase your awareness and appreciation using your senses of sight, hearing, smell, and touch to get to know trees better. Then you learned more about the detail of trees by drawing them from different perspectives.

Next you studied four general ecological concepts and the part that trees play in relation to each. The four concepts were energy flow, cycling of materials, interrelationships, and change. You then developed your investigations skills by doing a medical eco checkup of a tree.

Finally, as an opportunity to utilize your knowledge of community trees, your knowledge of ecological concepts, and your knowledge of eco checkups, you set up an interpretive trail and conducted a tour with family, friends, or neighbours. You concluded with environmental actions you can take part in to lessen the impact man has on the environment. This can be accomplished by refusing to use certain things, reducing your use of things, and reusing and recycling things whenever possible.



MODULE 3

Appendix

MODULE 3 Glossary

adapt	• change to suit changing circumstances or environment
biosphere	• the region of the Earth, including the atmosphere and the oceans, in which life can exist
by-product	• something produced during the manufacture of something else
carnivores	• meat eaters (carne = meat; vores = eat)
chlorophyll	• the green pigment found in plant cells that is necessary for photosynthesis
coniferous	• cone-bearing plants
deciduous	• trees with leaves that fall off seasonally, usually in autumn
decomposers	• organisms (bacteria, fungi) that break organic material down to its component minerals
food chain	• movement of food energy in an ecosystem from producers to different levels of consumers
heartwood	• the innermost nonliving part of a tree trunk that serves primarily as structural support
herbivores	• plant eaters
interpretive trail	• a trail with signs or guides that explain what is around it
interrelationships	• mutual relationships or dependencies

landfill	• a constructed hole in the ground into which garbage is dumped for storage.
nutrients	• the substances serving as food
photosynthesis	• the formation of carbohydrates and oxygen with the aid of light in the presence of chlorophyll (photo = light; synthesis = make)
recycling	• the reprocessing of used materials
sapwood	• the outer living portion of the inside of a tree, through which water and nutrients are moved
scavengers	• animals that feed on dead organic material e.g., crows, ravens
succession	• the process of development of plant communities one after the other in a prescribed order
trail guide	• a book that provides detailed information about trails
transpiration	• the giving off of water through the leaves of plants

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Environmental and
Outdoor Education Year One

Student Module Booklet
Module 3

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